

## Chapter 4 - General Requirements for Stormwater Facilities

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*Note: All Figures in Chapter 4 are courtesy of King County*

This chapter addresses general requirements for treatment facilities. Requirements discussed in this chapter include design volumes and flows, sequencing of facilities, liners, and hydraulic structures for splitting or dispersing flows.

### 4.1 Design Volume and Flow

#### 4.1.1 Water Quality Design Storm Volume

The volume of runoff predicted from a 24-hour storm with a 6-month return frequency (a.k.a., 6-month, 24-hour storm). Alternatively, the 91<sup>st</sup> percentile, 24-hour runoff volume indicated by an approved continuous runoff model.

Wetpool facilities are sized based upon use of the NRCS (formerly known as SCS) curve number equations in Chapter 2 of Volume III, for the 6-month, 24-hour storm. Treatment facilities sized by this simple runoff volume-based approach are the same size whether they precede detention, follow detention, or are integral with the detention facility (i.e., a combined detention and wetpool facility).

Unless amended to reflect local precipitation statistics, the 6-month, 24-hour precipitation amount may be assumed to be 72 percent of the 2-year, 24-hour amount. Precipitation estimates of the 6-month and 2-year, 24-hour storms for certain towns and cities are listed in Appendix I-B of Volume I. For other areas, interpolating between isopleths for the 2-year, 24-hour precipitation and multiplying by 72% yields the appropriate storm size. Isopleths for 2-year, 24-hour amounts for Western Washington are reprinted in Volume III.

#### 4.1.2 Water Quality Design Flow Rate

***Downstream of Detention Facilities:*** The full 2-year release rate from the detention facility.

An approved continuous runoff model should identify the 2-year return frequency flow rate discharged by a detention facility that is designed to meet the flow duration standard.

***Preceding Detention Facilities or when Detention Facilities are not required:*** The flow rate at or below which 91% of the runoff volume, as estimated by an approved continuous runoff model, will be treated. . At the time of publication, all BMPs except

wetpool-types should use the 15-minute time series from an approved continuous runoff model.

Design criteria for treatment facilities are assigned to achieve the applicable performance goal at the water quality design flow rate (e.g., 80 percent TSS removal).

- *Off-line facilities:* For treatment facilities not preceded by an equalization or storage basin, and when runoff flow rates exceed the water quality design flow rate, the treatment facility should continue to receive and treat the water quality design flow rate to the applicable treatment performance goal. Only the higher incremental portion of flow rates are bypassed around a treatment facility. Ecology encourages design of systems that engage a bypass at higher flow rates provided the reduction in pollutant loading exceeds that achieved with bypass at the water quality design flow rate.

Treatment facilities preceded by an equalization or storage basin may identify a lower water quality design flow rate provided that at least 91 percent of the estimated runoff volume in the time series of a continuous runoff model is treated to the applicable performance goals (e.g., 80 percent TSS removal at the water quality design flow rate and 80 percent TSS removal on an annual average basis).

- *On-line facilities:* Runoff flow rates in excess of the water quality design flow rate can be routed through the facility provided a net pollutant reduction is maintained, and the applicable annual average performance goal is likely to be met.

Treatment facilities that are located downstream of detention facilities should only be designed as on-line facilities.

~~*Estimation of Water Quality Design Flow Rate for Facilities Preceding Detention or when Detention Facilities are not required:*~~

~~Until a continuous runoff model is available that identifies the water quality design flow rate directly, that flow rate shall be estimated using Table 4.1, and its following directions for use:~~

~~Step 1 Determine whether to use the 15-minute time series or the 1-hour time series. At the time of publication, all BMPs except wetpool-types should use the 15-minute time series.~~

~~Step 2 Determine the ratio corresponding with the effective impervious surface associated with the project. For effective impervious areas between two 5 percent increments displayed in the table, a straight~~

~~line interpolation may be used, or use the higher 5 percent increment value.~~

~~Step 3 Multiply the 2-year return frequency flow for the post-developed site, as predicted by an approved continuous runoff model, by the ratio determined above.~~

<b>Table 4.1 Ratio of 91% Flow Rate to 2-Year Frequency vs. Effective Impervious Area</b>			
<b>15 Minutes data</b>		<b>Hourly data</b>	
<b>EIA</b>	<b>Ratio</b>	<b>EIA</b>	<b>Ratio</b>
10%	0.19	10%	0.19
15%	0.20	15%	0.20
20%	0.22	20%	0.20
25%	0.23	25%	0.21
30%	0.25	30%	0.22
35%	0.26	35%	0.23
40%	0.28	40%	0.24
45%	0.30	45%	0.25
50%	0.31	50%	0.26
54%	0.33	54%	0.27
60%	0.34	60%	0.28
65%	0.36	65%	0.28
70%	0.37	70%	0.29
75%	0.38	75%	0.30
80%	0.39	80%	0.30
85%	0.40	85%	0.31
90%	0.41	90%	0.31
95%	0.42	95%	0.32
100%	0.43	100%	0.32

#### 4.1.3 Flows Requiring Treatment

Runoff from pollution-generating impervious or pervious surfaces must be treated. Pollution-generating impervious surfaces (PGIS) are those impervious surfaces considered to be a significant source of pollutants in stormwater runoff. The glossary in Volume I provides additional definitions and clarification of these terms.

Such surfaces include those which are subject to: vehicular use; industrial activities; or storage of erodible or leachable materials, wastes, or chemicals, and which receive direct rainfall or the run-on or blow-in of rainfall. Erodible or leachable materials, wastes, or chemicals are those substances which, when exposed to rainfall, measurably alter the physical or chemical characteristics of the rainfall runoff. Examples include erodible soils that are stockpiled, uncovered process wastes, manure, fertilizers, oily substances, ashes, kiln dust, and garbage dumpster leakage. Metal roofs are also considered to be PGIS unless they are coated with an inert, non-leachable material (e.g., baked enamel coating).

A surface, whether paved or not, shall be considered subject to vehicular use if it is regularly used by motor vehicles. The following are considered

abrasion from upstream channel sediments. A four-sided gabion basket located outside the ordinary high water mark should be considered for these applications.

*Note: A Hydraulic Project Approval (Chapter 77.55 RCW) may be required for any work within the ordinary high water mark. Other provisions of that RCW or the Hydraulics Code - Chapter 220-110 WAC may also apply. Contact the appropriate regional office of the State Department of Fish and Wildlife.*

